State of California Dept. of Forestry P.O. Box 1185 Fort Bragg, CA. 95437

No. 24 December 1986

UNEVEN-AGED MANAGEMENT USING STRUCTURAL GROUPS

Rose Loveall [1]

Uneven-aged stands contain a minimum of three age classes and a multi-storied canopy. In the redwood region, some landowners feel that uneven-aged management offers the best combination of economic and aesthetic benefits. They often prefer taking an active part in managing their timberlands while continuing to enjoy them as residence sites and for recreational purposes. One method of uneven-aged management was demonstrated in the 1986 Pleiades timber sale.

The Pleiades 1986 timber sale area is located along Highway 20 and covers 29 acres of Site I timberland. The area was clearcut and burned in 1905. The naturally regenerated stand came back heavily to redwood, with a smaller component of Douglas-fir. A wildfire burned the sale area approximately 35 years ago. The first stand entry was made in 1969, when a very light commercial thinning was done. Due to this stand's history, a fairly wide distribution of age classes existed prior to the 1986 entry. Because of this stand structure, and because of the proximity to a scenic highway, this area was chosen for a prototype uneven-aged management method.

To bring a previously unmanaged stand to a desired uneven-aged structure usually requires a number of harvests. The standard approach to achieving stand regulation is through control of three factors: 1), the residual stocking level to be left after harvesting; 2), the diameter of the largest trees; and 3), the number of trees desired in each diameter class. These three factors will determine the position and slope of the characteristic "inverse J-shaped curve" (i.e., many more small trees than large ones) representing the diameter distribution of regulated uneven-aged stands.

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[1] Forestry Aide, JDSF, Fort Bragg (1985-86).

Methods

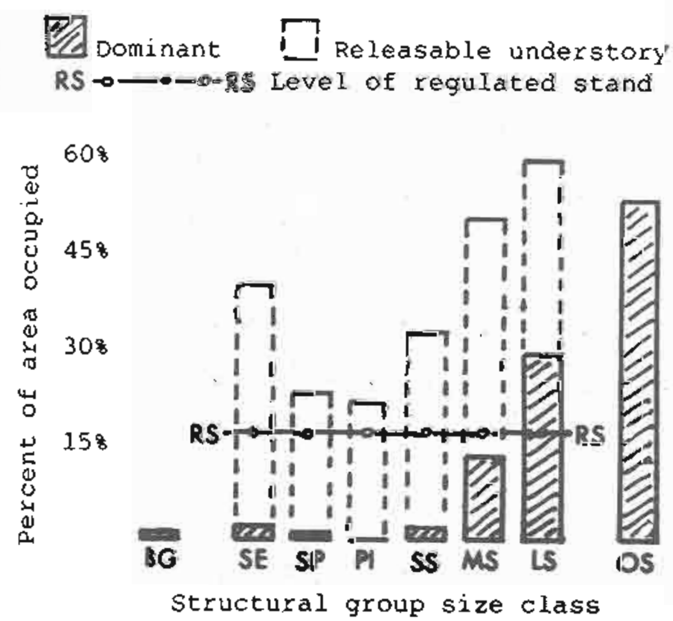
Information was needed to determine the present structure of the stand so it could be moved toward a true uneven-aged structure. A concept of structural group analysis developed by Dr. Ed Stone and Janet Cavallaro (1986) of UC-Berkeley's Forestry Department was used as the primary means to obtain data on existing size distribution. According to this model, a structural group is defined as a group of trees (two or more) of the same size class, having some part of their crowns overlapping. A single tree that does not have its crown overlapping with the crown of any other tree in its diameter class may also be classed as a structural group. Size classes of structural groups were designated as follows:

Size	Designation
none present	bare ground (BG)
<4.5" tall	seedling (SE)
0-6" dbh	saplings (SP)
7"-12" dbh	poles (PL)
13"-18" dbh	small sawtimber (SS)
19"-24" dbh	medium sawtimber (MS)
25"-30" dbh	large sawtimber (LS)
>30" dbh	oversize (OS)

Using this concept, a point sample cruise (167 points) was done. At each point, the dominant overstory structural group was tallied, as well as any structural groups comprising a releasable understory. Information from this cruise indicating the pre-harvest size class distribution is shown in Figure 1.

The theoretical regulated stand should be occupied in equal proportion by dominant structural groups in each of the six size classes from seedling through large sawtimber. This regulated stand is designated by line **RS** in Figure 1, which reveals a deficiency of structural groups in all the smaller size classes, and an excess of trees in the larger size classes (>24" dbh). However, it also indicates a significant amount of releasable understory in all size classes that fall short of the desired level (i.e., below line **RS** in Figure 1). This implies a potential for moving toward a regulated stand structure. All this information was consolidated into a prescription for selecting harvest trees.

Figure 1. Percent occupancy of structural groups by size class, in a dominant position and as releasable understory, prior to harvest.

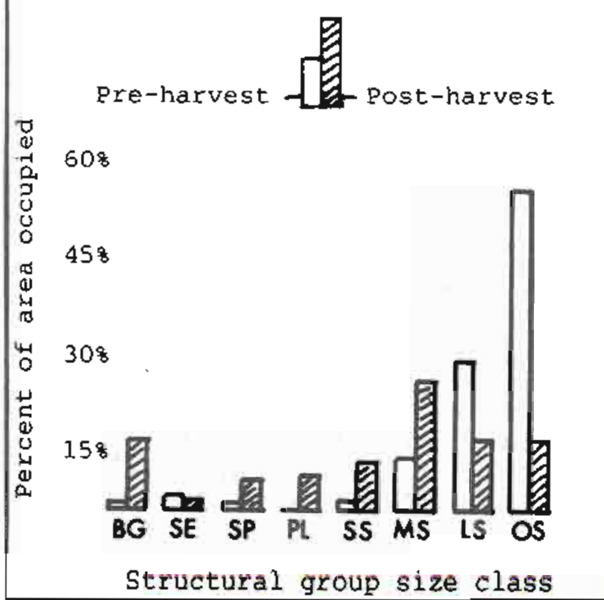


When we marked trees for harvest, our two primary objectives were to release trees in the under-represented smaller size classes and to harvest the largest trees wherever possible. The latter objective was not always possible, however, since some large trees had to be left after this harvest to assure that the site would not be opened to excessive competition from less desirable species. A third objective was to improve growth within structural groups by adjusting growing space for individual trees through thinning. Defective trees were generally marked for removal, although occasionally some were left to help maintain the stand structure or to protect the site. To achieve the desired structure, trees were removed individually or in small groups.

Because of the clumpy nature of redwood there is a high variability in spatial distribution. But since redwoods do not have to be evenly distributed to achieve their full growth potential, marking procedures were adopted that allowed leaving more than one tree per clump, even though this may have resulted in tighter spacing than would be considered optimal for most species.

After marking the stand a fixed radius cruise was done to determine the harvest and residual volumes. In addition, a second structural group point sample was taken, comparing the dominant structural group present at each point before the harvest with that expected after the harvest (as indicated by marked trees). Harvesting was done during the late spring and summer months of 1986. Skidding was almost entirely limited to trails built during the 1969 harvest. The sale contract limited the size of crawler tractors to D-6 or equivalent, and skidding damage to the residual stand was minimal. A follow-up cruise and structural group point sample was done following logging.

Figure 2. Pre- and post-harvest percent occupancy of structural groups by size class.



Findings

Structural group point samples taken after harvest disclosed various discrepancies between the projected and actual residual stand (Fig. 2). The three principal variations were a decrease in the number of small-size structural groups below expected values, an increase in the number of medium-size groups over expected values, and an increase in the area of bare ground. This discrepancy in numbers of structural groups seems to be sampling related, although the increase in bare ground may be due to inadequacies in the model's treatment of skid trail impact. Taken together, these differences will alter where the residual stand diameter distribution lies in relation to the theoretical distribution. It is apparent, however, that we were generally successful in increasing the occurrence of the smaller-size structural groups and in reducing the excess of oversize trees. Also, assuming that the bare ground component successfully converts to seedlings, we seem to have taken a good first step toward sustaining the desired mix of size classes.

The next entry is planned for 2002, depending on stand growth and development. Further monitoring of regeneration, mortality, growth and competing vegetation will aid in determining the productivity of this silvicultural method.

Literature Cited

Stone, Edward. C. and Janet I. Cavallaro. 1986. Development of a coast redwood growth model for use in developing silvicultural prescriptions. Report to Calif. Dept. of Forestry under contract no. 8CA30810; May, 1986. On file at JDSF.

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TO EXCAVATE OR NOT TO EXCAVATE

Glen J. Pinoli [1]

JDSF, as part of the Two Rock 1984 Timber Sale Agreement, required the purchaser, Harwood Investment Company, to construct and maintain approximately one-quarter mile of haul road using an excavator. Dump trucks were used to end-haul material to locations specified by the State. The Agreement also required that a D-6 (or equivalent) dozer be used to construct a pioneer trail as designated by the State.

The original excavator road location was changed at the request of the purchaser. This new location allowed additional yarder access to the sale area and required crossing a Class III watercourse (i.e., an intermittent stream).

The purpose of this project was twofold. First, we wanted to demonstrate road construction with an excavator on steep side slopes and adjacent to a watercourse. Obviously, we wanted to construct a stable roadbed while keeping sidecast to a minimum. And second, we wanted to collect time data and production rates for equipment and personnel for this type of road construction.

The purchaser contracted the excavator road construction with Homer Helm Logging. Helm first used a standard Caterpillar D-6C with a square blade for pioneer trail construction. This piece of equipment was later replaced by a D-6C with a full "U"blade, which is

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[1] Forester I / Timber Sale Officer, Jackson State Forest.

better suited for pioneering since it is easier to control sidecast material with this blad configuration. Following this change, sidecast was successfully kept to a minimum except in one area where, in the words of the purchaser, "too small a tractor tried to get around too large a stump."

The type of excavator used by the contractor was a Caterpillar 225 with a 1.3 cubic yard bucket. The excavator was also equipped with a "thumb," a hydraulically-operated, hinged appendage that greatly aided in brush removal and movement of larger rocks. Approximately 60 cubic yards of material was end-hauled. The remaining loose material was placed in the pioneered portion of the haul road to bring the road up to required grade, and in fill for the watercourse crossing.

While road construction and cutbank sloping were handled well by the excavator, the contractor made several recommendations that should be beneficial to future excavator road construction projects:

1. **Construct pioneer trail with excavator.** This will produce more sidecast but you will have better control over it.

2. **Bench sidecast material** where possible. This reduces the amount of end-hauling necessary.

3. **Dig out stumps with the excavator instead of the dozer.** This is more easily done with the excavator and stump holes can then be filled in with sidecast material.

Following is a summary of equipment and personnel used to construct the 1/4 mile of road. While no cost figures are exhibited, we estimate that this type of road construction is 50 to 100 percent more expensive than conventional forest road construction. All equipment time includes operator time:

Equipment/personnel	No. of Hours
Caterpillar D-6 Dozer	50
Chokersetter	29.5
Caterpillar 225 Excavator	47.5
Supervision	70
Dump Truck	10

The author would like to acknowledge the cooperation and professionalism of Fred Green of Harwood Investment Company and Homer Helm of Homer Helm Logging.

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BOOK REVIEW

Historian Ted Wurm's new book, "Mallets on the Mendocino Coast: Caspar Lumber Company Railroads and Steamships," is more than an excellent illustrated history book. It is a rich slice of life as it was during northern California's formative years.

The book documents a way of life that will never be seen again. From the dog-hole ports of the Mendocino Coast to the logging camps in the woods, and along the rivers and rails that connected them, Wurm shows us a product and culture that to this day are unique on the planet. It is to his credit as an author and historian that he has caught so much of the elusive flavor of this epoch in western American history. While maintaining historical accuracy, he interjects fascinating tidbits such as the deadly perils of "jackscrewing," that unique early means of loading the world's largest logs onto railcars. "Oldtimers" tell us that this was an operation in which men were "not infrequently crushed and killed as a result of one tiny slip while working under and alongside" monster redwood logs. And if not for Wurm, how many of us would remember the ill-fated steam lumber schooner **Caspar**? Built in San Francisco in 1888, this proud tub wrecked off Pt. Arena in 1897. "Only the Captain and one crewman survived," writes Wurm. "Thirteen others perished."

There are 12 well-written chapters with titles like "Working in the Woods," "Two New Locomotives and a Herd of Donkeys," and "Daisy," the latter being the subject of JDSF Newsletter No. 18. But as good as Wurm's writing is, it is the superbly rendered photographs that put the book into a class of its own. Many of these photos have never been published before. In one, the company's head cook--a Chinese gentleman by the name of Wah Bow--jauntily salutes the photographer with a shot of whiskey. Another rare shot shows the impressive wreckage of the mighty Jughandle Creek Trestle following the 1906 earthquake.

"Mallets" is a book that should appeal not only to rail and history buffs, but to anyone who has ever been fascinated by the redwoods. And while some of the railroading terms are quite technical, the book has a flavor and style that any reader can enjoy.

To order, you may write to : Interurban Press, P. O. Box 6444, Glendale, CA 91205. The retail price is $28.95, and the publisher requests that mail orders add $1.50 for postage and handling. California orders are subject to a 6% sales tax (more in some areas).

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RAY RICE WINS AWARD

Readers of these pages may remember that Dr. Ray Rice is the Principal Investigator for the joint federal-state venture known informally as "The Caspar Creek Watershed Study." Dr. Roger R. Bay, Director of the USDA Forest Service Pacific Southwest Forest and Range Expedriment Station, announced in November that Ray has received the Experiment Station's "Outstanding Scientist Award" for 1986.

Dr. Rice, who is research hydrologist at the Redwood Sciences Laboratory in Arcata, will receive a cash award, given annually to encourage "those individuals with an exemplary career, or for an unquestionably outstanding achievement in research." Dr. Rice received the award because of his research in all phases of wildland hydrology.

The emphasis of Rice's research has been to study the effects of forest management activities (such as road building and logging) on erosion and soil stability. His studies quantify the amount of sedimentation and soil erosion resulting from these activities. From his work, other scientists and land managers can better understand how these unstable lands can be managed more sensitively.

A native of California, Dr. Rice graduated in 1941 from Alexander Hamilton High School in Los Angeles. In 1951 he earned a BS in forestry from Montana State University, an MS in forestry from UC-Berkeley in 1961, and a PhD in wildland hydrology from Colorado State University in 1970. He was a pilot with the Army Air Corps and flew in Burma and China from 1944-45. His first job with the Forest Service was in Glendora, California as a fire control aide. He has also been stationed in Libby, Montana, Berkeley, and the Sierra and Cleveland National Forests.

Dr. Rice resides with his wife, Mary, in Arcata. They have three daughters: Marla, Barbara, and Claudia. In his spare time, Dr. Rice enjoys backpacking in the high country. His work for the Forest Serrvice takes him to such places as New Zealand, Japan, and Europe. His most recent trip has been to Yugoslavia to deliver a paper on erosion on forest roads.

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STAFF NOTES

In June we filled two new permanent positions. **Kelly Keenan**, who has worked for us in the past as a Forestry Aide, and had most recently worked as a scaler for Lousiana-Pacific, was appointed to the Forestry Assistant II position in the Timber Sales program. **Fay Yee**, having returned to work for us in March as a Forestry Aide, accepted the Forestry Assistant I position in the Demonstration and Experimental program. We are most fortunate to have them on our staff, and welcome them to CDF and JDSF.

The field season ended in October for our most recent crop of Forestry Aides. **Rose Loveall** (see page 1), **Charles Mussett, Jan Sorochtey,** and **Adam Wyman** did outstanding jobs for us, and we wish them all the best in their next endeavors.

We welcome the 1986-87 US Forest Service storm manning crew consisting of **Liz Keppler, Tom Sill, Rich Magnuson, Dave Salo, Mike Derrig,** and **Charles Mussett.**

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